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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,882	10/30/2003	Stefan Bader	5367-47	9126

7590 01/02/2008  
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EXAMINER

RAO, G NAGESH

ART UNIT	PAPER NUMBER
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1792

MAIL DATE	DELIVERY MODE
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01/02/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/696,882

Applicant(s)

BADER ET AL.

Examiner

G. Nagesh Rao

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Continued Examination Under 37 CFR 1.114***

1) A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/25/07 has been entered.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2) Claim 15 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification makes no mention whatsoever of a highly doped "silicone" as being the preferred material choice as the thermal radiation absorption layer. There is discussion of

non-metallic materials as well a highly doped silicon material at  $1 \times 10^{19}/\text{cm}^3$  concentration.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
- 3) Claims 1-2 and 5-15 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Maruyama (EP 1143047).

Maruyama 047 pertains to the fabrication of a semiconductor substrate that includes a growth area intended for a later material deposition (utilizing semiconductor based materials), affixing a thermal radiation absorption layer (PBS) on the rear side of the wafer facing away from the growth area prior to the deposition via a CVD like process (which is viewed as a substitution of equivalents towards the MOVPE growth step) of materials ontop of the substrate surface all in the while heating the substrate wafer to a deposition temperature (See Abstract and Figure 1). The materials exhibit an inert behavior during the deposition method as in accordance with the CVD processing, as well that involved with the PBS materials is a highly doped Si layer that delves into concentration factors of  $1 \times 10^{19}/\text{cm}^3$  and denotes the thermal radiation absorption layer may be affixed with the contact metallization (See Abstract, Figures 1-28, and Pp. 2-15).

Although applicant states their method is performed via MOVPE, MOCVD is understood in the art to be an alternative term for MOVPE. In anticipation of

applicant's objection, examiner points out to previously submitted evidence of such claim from the textbook "Electronic Materials Science For Integrated Circuits in Si and GaAs by James Mayer and S.S. Lau, as well a proper cited definition by Wikipedia (Filed 3/7/06).

Therefore it would be obvious to one having ordinary skill in the art at the time of the present invention to understand the incorporated use of MOVPE as merely a substitution of equivalents for the CVD technique.

4) Claims 1-6 and 11-15 are rejected under 35 U.S.C. 103(a) as obvious over Ohba (US Patent No. 6,242,764) in view of Maruyama (EP 1143047).

Ohba 764 pertains to a method for fabricating a III-N semiconductor light emitting element having strain moderating crystalline buffer layers. According to Ohba 764's specification the object of the invention shows a variety of ways of depositing an AlGaInN layer ontop of a SiC substrate while having a thermal absorption layer underneath the SiC substrate for exhibiting a good absorption of thermal radiation (See Col 2 Lines 15-68, Col 9 Lines 15-43 (5<sup>th</sup> Embodiment) and Figure 6). Examiner points out to figure 6 which clearly shows a SiC substrate (501) with a Al/Ti n-side electrode (522) reason being that an electrically conductive material is used for forming the substrate and an electrode is mounted

to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipitator, suggesting that the underlying layer 522 is acting as a thermal absorption layer-like means.

Finally the layers of AlGaInN or variations of the like are deposited via an MOCVD apparatus although described in the 6<sup>th</sup> embodiment it is explicitly stated to be also utilized in the 5<sup>th</sup> embodiment (See Col 9 Lines 45-59) whereby the SiC substrate is put on a susceptor which also acts as a heater thus capable of heating the substrate to the deposition temperature (See Col 9 Lines 60-68 and Col 10 Lines 1-29).

Although applicant states their method is performed via MOVPE, MOCVD is understood in the art to be an alternative term for MOVPE. In anticipation of applicant's objection, examiner submits evidence of such claim from the textbook "Electronic Materials Science For Integrated Circuits in Si and GaAs by James Mayer and S.S. Lau, as well a proper cited definition by Wikipedia.

It would be understood that if the heating capabilities of the MOCVD apparatus utilized in Ohba 764 would essentially effect the method step (c) claimed by applicant by means of thermal radiation and would inherently be used to generate thermal radiation from the heating source having a spectral range for which the thermal radiation absorption layer exhibits good radiation absorption.

Applicant's contend to the teaching of the deposition of the thermal absorption layer to the substrate prior to the growth of the structure on said wafer. This limitation is viewed as a resultant effective variable that can be ascertained by one having ordinary skill in the art at the time of the invention to implement as desired by the operator.

However to address applicant's contention on this matter and in view of the amended and additional claims, examiner puts forth analogous reference Maruyama 047 which that too pertains to the fabrication of a substrate wafer device and teaches the affixing of the PBS material (as discussed in the aforementioned rejection) as being a thermal radiation absorption layer on the rear-side of the substrate wafer in conjunction with the metallic contact (as denoted as reading on as an absorption layer) and as well teaching in particular embodiments that this done prior to the growth of the rest of the device's structure on the front end portion of the semiconductor device (See Abstract, Figures 1-28, and Pp. 2-15).

Therefore it would be obvious to one having ordinary skill in the art at the time of the present invention given the known details of Ohba 764 and well known processing parameters towards MOVPE substrate structure fabrication in conjunction with the teachings of Maruyama 047 to deposit said thermal



absorption layer either at the beginning of device fabrication or at the end of the device fabrication, being that the same structure resulting occurs and the methodology is applied in an analogous manner based on the operator's chosen optimized parameter setting. As well more so according to Maruyama 047 the addition of the PBS backing allows for absorption of impurities and heat transfer to prevent any warpage or damage in the silicon substrate.

5) Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohba (US Patent No. 6,242,764) in view of in view of Maruyama (EP 1143047) in further view of Hirano (US Patent No. 5,771,110).

From the aforementioned combination of Ohba 764 and Maruyama 047 pertaining to methods for fabricating a III-N semiconductor light emitting element having strain moderating crystalline buffer layers that reads on parts of applicant's claimed invention.

However Ohba 764 and Maruyama 047 fail to explicitly teach sputtering as a technique for depositing a thermal radiation absorption layer.

In a method pertaining to thin film structure device techniques Hirano 110 teaches that it is known to use a sputtering technique for deposition of a thermal absorption layer film (See Col 15 Lines 19-40 and Col 16 Lines 30-65).

It would be obvious at the time of the invention to one with ordinary skill in the art to modify the teachings of Ohba 764 and Maruyama 047 with Hirano 110 by employing a sputtering technique because the higher rate of deposition results in lower impurity incorporation because fewer impurities are able to reach the surface of the substrate in the same amount of time. Sputtering methods are consequently able to use process gases with far higher impurity concentrations than the vacuum pressure that MBE methods can tolerate. During sputter deposition the substrate may be bombarded by energetic ions and neutral atoms. Ions can be deflected with a substrate bias and neutral bombardment can be minimized by **off-axis sputtering**, but only at a cost in deposition rate.

Furthermore Hirano 110 teaches the advantages of using an amorphous based silicon layer preferably doped as a type of thermal absorption layer, albeit it teaches a variety of doping ranges and thickness ranges for the thermal absorption layer it does not indicate any specified reasons as to why those dimensions are desired. Examiner notes that applicant too has denoted thickness and doping values, but in the specification there is no apparent reason or significant explanation teaching why those traits are desired.

Therefore it would be obvious at the time of the invention to one with ordinary skill in the art to modify the teachings of Ohba 764 Maruyama 047 to utilize a thermal absorption layer such as a doped silicon layer (which is denoted as a non-metallic layer) from the teachings of Hirano 110 underneath a SiC substrate to be able to have lattice coordination and avoid lattice mis matchings with two silicon based materials rather than a silicon and non-silicon based material, and as well derive the same benefit of a thermal absorption layer as desired by Ohba 764 Maruyama 047.

***Response to Arguments***

6) Applicant's arguments filed 10/25/07 have been fully considered but they are not persuasive.

Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571)272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GNR

*/Robert Kunemund/  
Robert Kunemund  
Primary Examiner  
TC 1700*